

## TAXONOMIC AND CYTOLOGICAL NOTES ON ASIATIC CROCUS

BRIAN MATHEW\*, C. A. BRIGHTON\* & T. BAYTOP†

**ABSTRACT.** A new species, *Crocus asumaniae* Mathew & Baytop (Iridaceae), related to the Saffron *Crocus*, is described from southern Turkey. Its relationship with allied species is discussed and keys and cytological data are provided. A new cytotype in the *C. pallasii* complex is described.

***Crocus asumaniae* Mathew & Baytop, sp. nov.** *C. cartwrightiano* affinis sed floribus plerumque albis vel raro pallide lilacinis, foliis glabris, et stylo superiore diviso differt.

Corm ovoid, c. 1.5–2 cm diameter; tunic fibrous, the fibres very slender and finely reticulated, extended at the apex of the corm into a neck 3–4 cm in length. *Cataphylls* 2–3, papery white. *Leaves* 6, hysteranthous or with the tips just showing at anthesis, 0.5–1.25 mm broad at maturity, slightly greyish-green, glabrous. *Flowers* 1–3, white, occasionally with dark veins near the base of the segments, rarely very pale lilac; throat glabrous, whitish or pale yellow. *Bract and bracteole* unequal, white, membranous with long-tapering, rather flaccid tips. *Perianth-segments* oblanceolate or narrowly elliptic, obtuse to acute, 2.5–3 × 0.5–1 cm, unequal, the inner slightly smaller than the outer. *Filaments* white or pale yellow, glabrous, 2–5 mm long. *Anthers* linear, yellow, 1–2 cm long. *Style* reddish-orange, divided well above the base of the anthers into 3 slender clavate branches, each 1.3–2 cm long and considerably exceeding the anthers, at least half the length of the perianth segments. *Capsule* c. 1 cm long, ellipsoid. *Seeds* reddish-purple, subglobose, 2–3 mm diameter, with a pointed caruncle about 1 mm long; raphe a rather indistinct ridge running the length of the seed; testa covered with a dense mat of long papillae.  $2n = 26$  (ISTE 36254).

Turkey. C3 Antalya: near Akseki, 900 m, 6 xi 1976, *T. Baytop* ISTE 36254 (holo. K; iso. ISTE, E); 5 km from Cevizli, 1250 m, in *Quercus cerris* woodland, 16 x 1973, *A. Baytop* ISTE 26884 (ISTE, K); Murtiçi to Akseki, 21 x 1976, *H. Leep* L 76/T86 (colour photo K), *H. Leep* L77/T71 (K).

This new species is named after Asuman Baytop of the Herbarium of the Faculty of Pharmacy, Istanbul University.

*Crocus asumaniae* belongs to a small group of autumn-flowering species having a red three-branched style and a finely reticulated corm tunic. The related *C. sativus* L. has a particularly well-developed style which has been well-known as the source of the dye and medicinal substance saffron since at least the first century A.D.

The other species in this group as defined by Mathew (*Crocus sativus* and its allies. *Plant Syst. Evol.* 128: 89–103, 1977) are *C. cartwrightianus* Herb. from Greece (incl. *C. oreocreticus* B. L. Burt), *C. dispathaceus* Bowles from

\* Royal Botanic Gardens, Kew, Richmond, TW9 3AE, Surrey.

† Faculty of Pharmacy, University of Istanbul, Turkey.

S Turkey and Syria, *C. hadriaticus* Herb. from Greece, *C. moabiticus* Bornm. & Dinsm. from Jordan, *C. pallasii* Goldb., a widespread species from Bulgaria eastwards to Iran, and *C. thomasii* Ten. from Italy and Jugoslavia. The Greek *C. niveus* Bowles is also included but is the least related member.

*Key to C. sativus and its allies*

- |    |   |                           |
|----|---|---------------------------|
| 1a | Bract firm and closely sheathing the perianth-tube, veined and spotted or stained with reddish-brown or green; apices of style-branches usually dissected or lobed. S Greece                              | <i>C. niveus</i>          |
| 1b | Bract flaccid and usually not closely sheathing the perianth-tube, membranous and white or $\pm$ transparent with no markings; apices of style-branches often expanded, $\pm$ entire or at most fimbriate | 2                         |
| 2a | Style-branches more than half as long as perianth-segments  | 3                         |
| 2b | Style-branches up to half as long as perianth-segments  | 7                         |
| 3a | Perianth-segments 1.5-3.2 cm long; style branches 1.3-2.7 cm long   | 4                         |
| 3b | Perianth-segments 3.5-5 cm long; style branches 2.5-3.2 cm long. Cultivated or a relic of cultivation   | <i>C. sativus</i>         |
| 4a | Throat of perianth glabrous; style divided above or below base of anthers   | 5                         |
| 4b | Throat of perianth pubescent at insertion of filaments; style divided well below base of anthers  | 6                         |
| 5a | Flowers white, rarely faintly lilac; style divided well above base of anthers. S Turkey   | <i>C. asumaniae</i>       |
| 5b | Flowers mid to deep purplish-lavender; style usually divided below base of anthers, sometimes just above. Crete   | <i>C. oreocreticus</i>    |
| 6a | Perianth-segments 3-7 mm wide, elliptic or narrowly oblanceolate, white, veined with purple; leaves appearing after flowering. Jordan   | <i>C. moabiticus</i>      |
| 6b | Perianth-segments at least 7mm wide, usually obovate, purple, lilac or white, sometimes veined purple on a white ground; leaves visible at flowering time. Greece   | <i>C. cartwrightianus</i> |
| 7a | Flowers white, rarely tinged with lilac; throat usually yellow, occasionally white. Greece  | <i>C. hadriaticus</i>     |
| 7b | Flowers lilac to reddish-purple; throat white, lilac or yellow  | 8                         |
| 8a | Throat, and often the filaments, pale yellow. Italy, W Jugoslavia   | <i>C. thomasii</i>        |
| 8b | Throat and filaments white or lilac   | 9                         |
| 9a | Flowers deep reddish-purple; style-branches yellow or orange; 2 prophylls present. S Turkey, N Syria  | <i>C. dispathaceus</i>    |
| 9b | Flowers pale to deep lilac-purple; stigma red or rarely orange; 1 prophyll present. Bulgaria eastwards to Iran  | <i>C. pallasii</i>        |

The length of the style branches in relation to the length of the perianth-segments is a useful character in separating the species, as also to some extent is the point at which the style divides. *C. asumaniae* differs from *C. dispathaceus*, *C. hadriaticus*, *C. pallasii* and *C. thomasii* in having style branches which are more than half as long as the perianth-segments. *C. sativus* is a sterile triploid plant of cultivation with very large purple flowers, and thus cannot be confused with the new white or pale lilac-flowered species. *C. moabiticus* and *C. cartwrightianus* have styles which divide into three long branches low down in the throat of the flower, well below the base of the anthers. *C. asumaniae*, on the other hand, has the point of division well above the base of the anthers, sometimes even as much as half way up the anthers. The style branches are long and slender and rather weak so that they tend to flop outwards rather than remaining erect within the flower.

The taxon most closely allied to *C. asumaniae* appears to be the Cretan *C. oreoreticus* which however is a poorly understood species and in need of further study, especially in the field—in fact it is not yet certain how many taxa of the "*C. sativus* group" occur on the island of Crete. Like our new species, *C. oreoreticus* has glabrous leaves and a glabrous throat to the perianth. The point of style division in *C. oreoreticus* is normally similar to that of *C. cartwrightianus*, i.e. very low down in the throat, but one specimen seen shows a higher point of division, just above the base of the anthers, thus resembling *C. asumaniae*. Whether or not this one Cretan collection really belongs to *C. oreoreticus*, or indeed whether this latter taxon is separable from *C. cartwrightianus*, must remain an open question for the time being. *C. asumaniae* is however separable from all Cretan material in normally having white, or at most very faint lilac flowers while those of *C. oreoreticus* are of a deeper purplish-lavender.

The chromosome numbers previously reported for the *C. sativus* aggregate are  $2n = 16$  for *C. cartwrightianus*, *C. oreoreticus*, *C. hadriaticus*, *C. thomasii* and *C. pallasii* subsp. *haussknechtii* (Boiss. & Reut. ex Maw) Mathew;  $2n = 14$  for *C. pallasii* subsp. *pallasii* and  $2n = 12$  for *C. pallasii* subsp. *turcicus* Mathew. The cultivated *C. sativus* proved to be triploid with  $2n = 24$  (Brighton, C. A. Cytology of *Crocus sativus* L. and its allies. *Plant Syst. Evol.* 128: 137–157, 1977).

Two collections of *C. asumaniae* were examined and were found to have  $2n = 26$  chromosomes, a new number in the *C. sativus* aggregate. The karyotype consisted of one large pair of acrocentrics with small satellites on the long arms of one of the chromosomes, one pair of large submedians, seven pairs of acrocentrics grading down in size and four pairs of median to submedian chromosomes (Fig. 1a). Small satellites were also observed on the short arms of three pairs of acrocentrics.

On the basis of their overall similarity 20 of the 26 chromosomes could be grouped in sets of four. The remaining three pairs were the largest chromosomes in the karyotype. This grouping of the chromosomes into sets of four could possibly be interpreted as indicating a polyploid origin for this species although meiotic studies are needed to confirm this.

Intraspecific variation in chromosome number is found quite frequently in the genus *Crocus* and counts of  $2n = 12$ , 14 and 16 have been recorded in the *C. pallasii* complex (see above). A new cytotype in this complex, with  $2n = 14$ ,



FIG. 1. Karyotypes of: a, *C. asumaniae*,  $2n = 26$ ; b, *C. pallasii* subsp. *turcicus* 69-1121,  $2n = 12$ ; c, new cytotype 77-1708,  $2n = 14$ ; d, *C. pallasii* subsp. *haussknechtii*,  $2n = 16$ .

was collected in 1977 from northern Iran (31 km east of Sanandaj, *Fliegner & Simmons* 504, K). The karyotype consisted of one large pair of metacentric chromosomes, two pairs of large acrocentrics, two pairs of smaller metacentrics and two pairs of small acrocentrics (Fig. 1c).

Morphologically this new cytotype is closest to *C. pallasii* subsp. *haussknechtii*, however, cytologically it appears to be closer to *C. pallasii* subsp. *turcicus* which also has one large pair of metacentric chromosomes in the karyotype (Fig. 1b). These are absent from *C. pallasii* subsp. *haussknechtii* (Fig. 1d). Although *C. pallasii* subsp. *pallasii* ( $2n = 14$ ) exhibits a wide range of intraspecific variation none of the karyotypes are similar to the new one and they are also separated geographically from it.

#### ACKNOWLEDGMENTS

We should like to thank Dr Hans Jürgen Leep from Wuppertal, Germany, for sending living material and colour photographs of his collections of *Crocus asumaniae*, and for notes on the variation in flower colour; also Mr J. Simmons and Mr H. Fliegner (both R.B.G., Kew) for material of the new cytotype in the *C. pallasii* complex.